

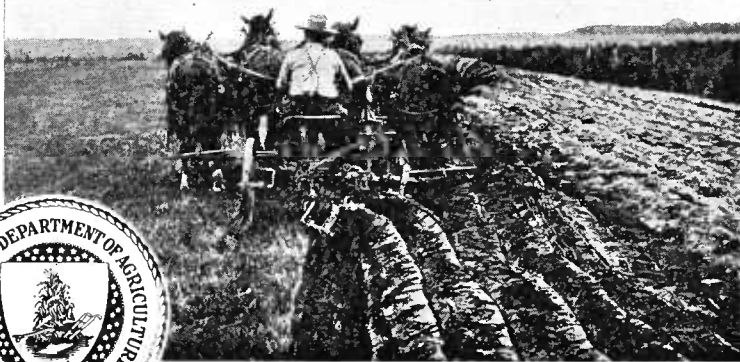
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U. S. DEPARTMENT OF  
AGRICULTURE

FARMERS' BULLETIN No. 1289

DISTRIBUTION  
OF TYPES  
OF FARMING  
IN THE  
UNITED STATES



**I**T IS possible, at least in a general way, to determine what farm enterprises are adapted to a region by studying the physical, biological, and economic conditions prevailing in the region, and the adaptability of the various enterprises to these conditions. The present bulletin is an attempt to analyze the farming of the country on this basis. The presentation is necessarily fragmentary, because so little investigation has been made in this direction. The part played by minor enterprises on the farm has perhaps not been sufficiently emphasized. Not infrequently the major enterprises are depended upon to pay the expense of conducting the business, while the real profit comes from minor branches of the business. But the big mistakes in type of farming relate to the major enterprises, particularly when changes in type become necessary.

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# DISTRIBUTION OF TYPES OF FARMING IN THE UNITED STATES

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## PURPOSE OF THIS BULLETIN.

**A** PRACTICAL QUESTION which confronts farmers at all times is whether to keep on with present types of farming or to change to other types. Thinking farmers in all parts of the country discuss this question freely. In the South probably the most frequent question is whether it would not be to the advantage of that section to diversify its farming so as to become less dependent on cotton. In the far West farmers are asking whether they can continue with profit the production of vegetables for eastern cities, at least on the scale recently prevailing, in view of the great increases in transportation costs. New England farmers are considering whether, in view of the present high price of land in the Middle West and the high freight differential in their favor, they can not again produce the major portion of the feed they now buy from other sections. Idaho farmers, who this year are unable to sell their big potato crop, are considering abandoning potato culture. The temporary depression in the price of tobacco recently led many farmers to abandon this crop or to reduce their acreage of it.

It was a question of this character that led to the preparation of this bulletin. Farmers in the Central Corn Belt States have put a proportionately large percentage of the crop land in corn. The question was propounded to the department whether these farmers had not gone too far in this direction, and whether it would not be to their advantage, and to the advantage of the Nation as a whole, for them to cut down the acreage of corn to some extent, and if so, what other crops should expand to occupy the area thus made available.

This could not be answered until a study had been made of the factors that control the distribution of types of farming in this country. But an approximate answer was found. Along with it

were found approximate answers to similar questions in all parts of the country. As a result it is now possible to give at least a tentative answer to the question whether the types of farming that prevail in the more important agricultural sections of the country are those that ought to prevail, and to suggest in a general way the changes that ought to occur in those sections where a change in conditions has made changes in type of farming necessary.

It is obvious that a question of this character is so large and has so many angles that it can not be discussed in great detail within the limits of a bulletin. Technical details must be left for future consideration. Many questions are yet unanswered. In the case of some of them future developments will determine the answer. We can judge the future only by past and present conditions. Yet when we come to understand the forces at play, and are able to see why conditions are what they are, we can often approximate future conditions to some extent. We can, for instance, judge something of future increase in population, and the effect of this increase on market conditions for many farm products. But we can not foresee all the effects of future development in methods of controlling the boll weevil, for instance, for we do not know what these developments are to be. Likewise, we can not foresee future changes in cost of transportation, and these will have an important bearing on the distribution of types of farming.

The treatment of the problem in this publication must therefore be considered tentative and not final. It is merely a first approximation at an important result. Future studies will doubtless furnish material for more definite conclusions on many points. Nevertheless the situation seems to be sufficiently cleared up to justify some important conclusions, and these have been set forth in this bulletin.

It is particularly to be emphasized here that the problems discussed relate to general regions, rather than to specific localities. More detailed information as to purely local conditions of soil, topography, the presence of insect pests, and fungous diseases, is necessary before these general principles can be applied to single localities.

Cotton, corn, wheat, oats, and hay each occupy more than 30,000,000 acres on American farms. Together, these five crops occupy 87½ per cent of the total crop area of the country. No other crop occupies as much as 8,000,000 acres. It is evident that the farming of most sections must be based primarily on one or more of these five crops. We may therefore call them the major crops. Most of the discussion in this bulletin will relate to them.

#### CLASSES OF FACTORS CONTROLLING THE DISTRIBUTION OF FARM ENTERPRISES.

The factors that control the distribution of farm enterprises may be divided into three well-defined groups: Physical, biological, and economic, examples of which follow:

*Physical factors*, such as soil and climate. Soil character is one of the factors that determine the relatively small acreage of wheat and the large acreage of oats in Iowa. The character of the prevailing soil types is also partly responsible for the extensive de-

velopment of truck farming in New Jersey. The distribution of cotton is limited by temperature. The northern limit of winter wheat production is defined by winter temperatures and by rainfall (including snowfall). The small acreage of hay in the South is partially due to the difficulty of curing hay with the heavy rainfall prevailing in the eastern portion of that section.

*Biological factors.*—The characteristics of plants that affect their adaptation to physical conditions are included here. The preference of alfalfa for alkaline soils accounts in part for its greater relative prominence in the West than in the East. The acreage of hay in certain localities in the South and in some of the South Central States is more or less limited by the absence of hay crops adapted to local climatic conditions. Wheat is less important in Wisconsin than in adjacent States partly because neither winter nor spring varieties are fully adapted to the climatic conditions. Wheat was formerly important in this State, but readily gave way to the production of forage for dairy cattle.

Another class of biological factors is seen in the effect produced by certain insect pests and fungous diseases. Flax has moved westward in the northern Plains States because the soils of the older flax-growing sections became infested with flax wilt; also because the older lands became so badly infested with weeds. The Hessian fly has changed the date of seeding winter wheat in some localities, and has also probably reduced the acreage of this crop in some sections. The chinch bug has reduced the acreage of corn in southern Illinois. The ravages of an insect have practically eliminated the sunflower as a farm crop in Lawrence County, Ill., where this crop was formerly important. The boll weevil is reducing the acreage of cotton in certain parts of the Cotton Belt.

*Economic factors.*—The most important economic factors limiting the distribution of crops are: value per unit of weight, and distance to market (cost of transportation). Under pre-war conditions the value of a pound of cotton was about 12 cents; for this reason cotton could, if necessary, be shipped around the world. Wheat was worth nearly 2 cents a pound and could therefore be shipped half around the earth. Corn and oats were worth a cent a pound or less and could be shipped only a few hundred miles except to high-priced markets. Hay, at the farm, in the Middle West, was worth half a cent a pound, hence could not be shipped any great distance unless the purchaser could pay a high price for it.

Another important economic factor is competition with other regions that can produce more cheaply. This is one of the factors that limit the acreage of corn, wheat, oats, barley, and rye in those parts of New England where these crops thrive. Competition with other more profitable crops also limits the acreage of corn and the small grains in New England.

In what follows, these classes of factors are used to explain the agriculture of each of the States. In general the farming throughout the country has assumed its present form in response to well-defined physical, biological, and economic forces, and any attempt to make material changes in the farming of a section without full knowledge of these forces is likely to lead to confusion and to severe losses on the part of farmers.

## DISTRIBUTION OF THE MAJOR CROPS.

Figure 1 shows for the year 1919, according to census data, the percentage of the total crop area in each State occupied by each of the major crops, and also by fruits, vegetables, and all minor crops in each State that occupy 4 per cent or more of the crop area of the State. In the chart the States are divided into certain more or less well defined groups according to the principal types of farming prevailing in them.

In discussing the factors that determine the agriculture of each of these groups it is believed that the clearest presentation results by discussing the groups in the order in which the factors are most evident. The fewer the enterprises adapted to a region the more evident the factors determining those enterprises. This will become clear as the discussion proceeds. It happens that the New England States have the fewest enterprises, so they are discussed first.

The group having the next fewest enterprises, and consequently the next group of States in which the factors determining type of farming are most evident, consists of the cotton-growing States from North Carolina to Texas. The discussion of the Cotton Belt therefore follows that of New England. Then follow the western Mountain and Pacific States, the States of the Plains region, and finally the Corn Belt States. The States in the Corn Belt have the greatest variety of enterprises, which means the smallest number of limitations on type of farming.

## NEW ENGLAND.

The New England States compose the first group. Their agriculture is very distinctive and is not approached in type by that of any other State except New York and certain of the Mountain States of the West. The peculiarities of New England agriculture appear to be due, in the main, to the following causes: Cotton, for instance, is not grown there because the seasons are too short and the climate too cool. The small percentage of corn acreage is due in part to similar causes. The season is so short that it is not safe to rely on corn to the extent it is relied on farther south. The fact that the percentage of corn increases markedly in the southern part of this group, together with the fact that the group next toward the south has a much higher percentage, indicates that if the New England climate were better suited to corn more of it would be grown there.

But there are other reasons. In 1889 New England grew 239,000 acres of corn. The acreage at the next three censuses was 181,000, 183,000, and 116,000 acres, respectively. This decrease seems to be due largely to the growing importance of vegetable crops in New England, which occupy the best lands, formerly occupied partly by corn. Competition with the West may also have a considerable influence in the matter.

*Wheat.*—Wheat is practically absent from these States. New England formerly grew a considerable quantity of this crop. The reduction in acreage is probably due to the same causes as operated in reducing corn acreage—the need of good land for the growing

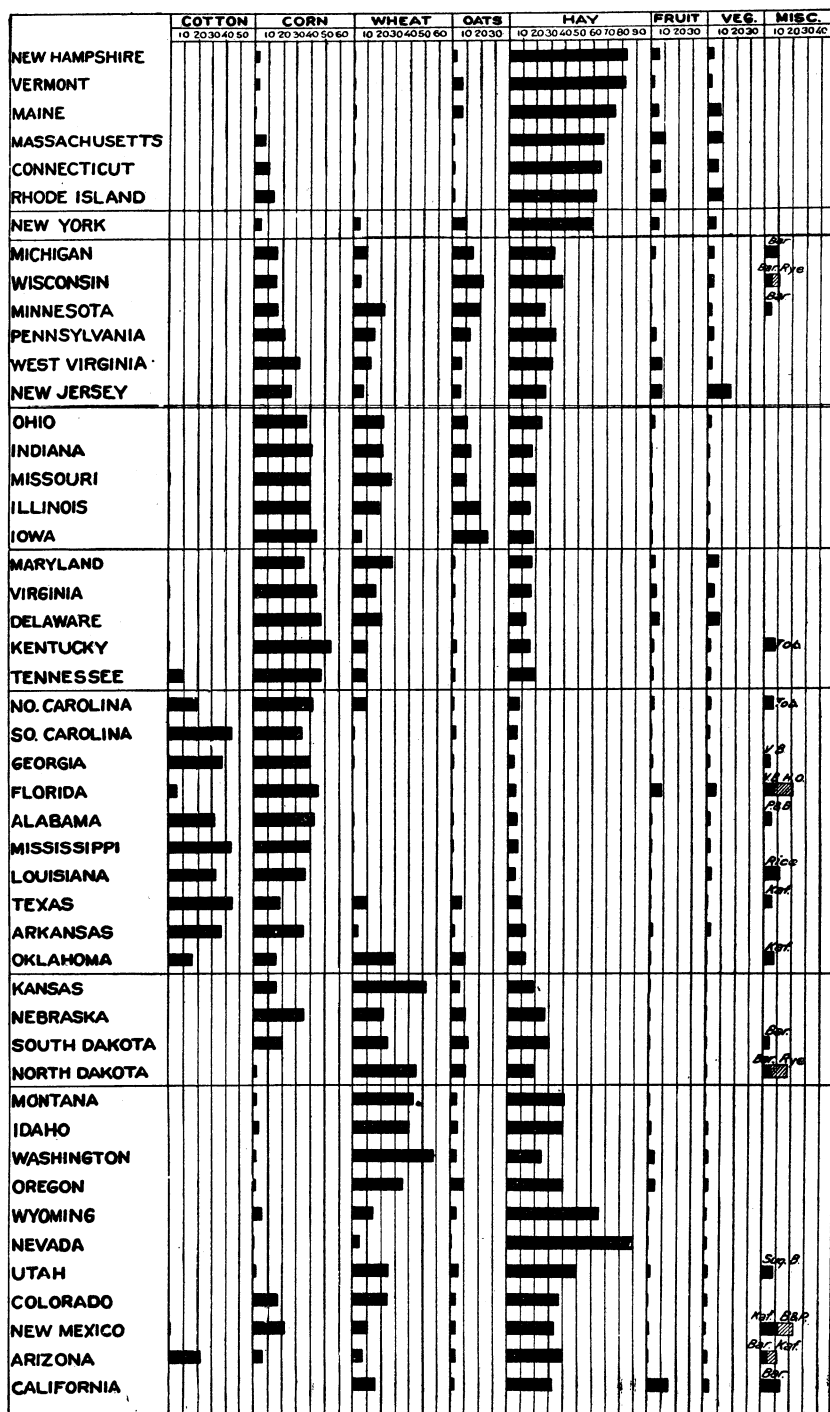


FIG. 1.—Percentage of crop area occupied in 1919 by crops named.



trucking industry and competition with other wheat-producing regions.

*Oats.*—Oats are grown to a considerable extent in Vermont and Maine. This crop yields as well in parts of New England, and the weight per bushel is as satisfactory, as in the North Central States, where the bulk of the commercial oats of the country is grown. Barley, rye, and Canada field peas also do very well there, so far as climatic conditions are concerned. These all make good feed for dairy cows. Hence, all these crops are grown to some extent in New England, sometimes for grain, but more often for hay or for green fodder. A mixture of oats and peas is sometimes sown. Occasionally oats, barley, and peas are sown together for grain, but the acreage of all these crops put together is small in this territory.

The reason for this small acreage is that it costs more to produce a given amount of grain on the small, rocky, hilly fields which comprise so much of New England farm land, where small teams and implements are used and much of the work is done by hand, than it does on the broad, level fields of the Middle West; at least, this was the case so long as western farm lands were cheap. The New England farmer could get a better price for these crops than the western farmer, but not enough more to enable him to compete with cheap land in the West in the production of oats, rye, or barley for market. Whether it would now pay to grow these grains at least for home use and thus largely reduce the cash outlay for feed will be considered later.

*Fruits and vegetables.*—In the columns of the chart showing the percentage acreage of fruits and vegetables the New England States stand out prominently, as do the other States along the northern Atlantic seaboard. In fact, these States are the only ones except Florida and California that show a relatively large percentage acreage of crops of this class. The entire fruit crop of the United States occupies only 1.6 per cent, and the entire vegetable crops, including both white and sweet potatoes, only 2 per cent of the total crop area of the country. Whether the New England States have as large a percentage of their acreage in crops of this class as they should have may be questioned.

*Hay.*—We now understand why it is that hay occupies such a large percentage of the crop area of the New England States. It is not because hay does better here than elsewhere. New England farmers devote most of their land to hay because they have no other choice. The hay acreage in these States runs from 61.6 per cent in Rhode Island to 83.9 per cent in New Hampshire, being greatest in those States least adapted to corn.<sup>1</sup>

The bulky nature of hay, with the relatively high cost of transporting it, works to the advantage of the New England farmer. Many large cities within the region have hitherto offered an excellent market for hay, and the need of these cities for milk has made in turn a large use for hay on New England farms. The preponderance of the hay crop in this region is thus the result of a combination of climatic and economic conditions.

<sup>1</sup> The acreage of hay and forage as published by the Census Bureau include acres of corn cut for fodder which is eliminated in the above figures. Revised figures, as given in the U. S. Dept. of Agr. Yearbook for 1920, were used in calculating percentages.

A large and rapidly increasing city population in this section provides a market for an enormous quantity of fresh milk. Local dairymen have a great advantage in this market because milk can not be shipped an indefinite distance. The production of market milk may therefore logically occupy as much land as is needed to supply what the market will take. The cows required to produce this milk consume most of the hay which occupies by far the greater portion of the crop land of the region. At present the possibility of milk production in New England is somewhat greater than the market demand for fresh milk, especially in summer. Cheese and butter manufacture, at least during the season of the summer surplus of milk, is a desirable adjunct to the market milk business and even a necessary one.

The large population to be fed renders truck farming and fruit growing logical for this region. As the population grows, the land devoted to these classes of crops should increase. The advantage of production near market, especially in the case of truck crops, ought to enable New England producers to compete in New England markets with more distant regions. Figure 2 shows the competing regions graphically.

Column 1 of this figure shows the area devoted to commercial vegetables (other than potatoes) in each of the States. The second column shows the acreage of potatoes and the third, the acreage of fruits. The area of crops of this class in the six New England States is smaller than that in New York State alone. New York is the principal competitor of the New England States for their nearest markets during the marketing season of that section. Pennsylvania has a large acreage of these crops, marketed mostly within its borders. New Jersey has large areas of commercial vegetables, and supplies in part some of the cities which New England farmers might supply during part of the season. Maryland, Delaware, Virginia, North Carolina, South Carolina, Georgia, and Florida ship their products earlier in the season, and are not serious competitors with New England producers. New England vegetable growers should understand that New York and New Jersey are the principal regions with which they must compete. States farther south, however, compete with hothouse vegetables grown in New England for the winter trade.

In fruit production the competition has a wider range, particularly in the case of apples, for all regions producing winter apples are in competition with each other. But the nearness of the New England fruit grower to his market is an advantage which should enable him to meet the competition from other regions. It seems logical, therefore, to encourage the further development of truck farming, potato culture, and fruit growing in New England, as markets develop for the products.

So far as there is a market demand for hay, it is a logical product for New England farmers to raise, at least so long as any considerable proportion of the local market demand must be met by hay shipped from distant regions. The high cost of transportation of this cheap

and bulky product will keep the price at a point that will make hay production profitable in New England.

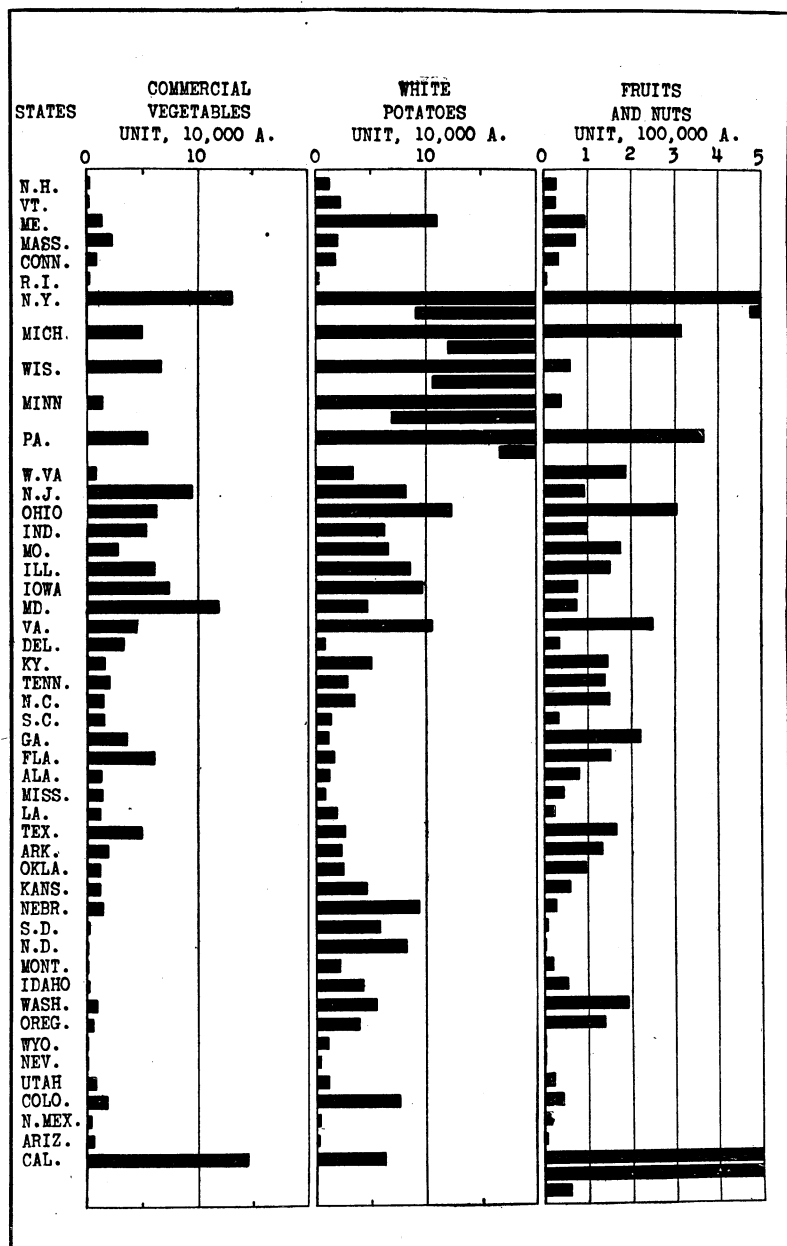


FIG. 2.—Acres of commercial vegetables (other than potatoes and sweet potatoes), white potatoes, and fruits and nuts, census of 1919, by States.

But there has been a marked decline in the number of horses in cities during the last census period, amounting to 47.3 per cent for

the New England States (see accompanying table). This has materially reduced the demand for market hay and is a factor which eastern hay producers must take into consideration.

*Decrease in horses not on farms, from 1910 to 1920.*

	Per cent.		Per cent.
New England-----	47.3	West South Central-----	33.3
Middle Atlantic-----	53.5	Mountain-----	38.9
East North Central-----	48.4	Pacific-----	64.1
West North Central-----	49.8		
South Atlantic-----	29.7	United States-----	46.4
East South Central-----	27.9		

Poultry farming is another type which is already prominent in New England, and which it would appear logical to develop further. The New England poultryman has the advantage of nearness to market and, by proper organization of his marketing system with a view to getting his products on the market as fresh as possible, he should be able to compete with any other section. It is true that feed is more expensive to him than it is to his competitors in the Middle West. He must overcome this disadvantage by securing the extra price that can be had for strictly fresh products. The market for the best quality of eggs at high prices is sufficiently extensive to absorb local production in New England.

Poultry farming, however, presents a degree of risk. Until recently, the ordinary farm flock, which finds its living largely in the form of materials that would otherwise go to waste on the farm, and which is cared for by farm women and children and thus does not compete with other farm enterprises for labor, produced sufficient eggs to meet market requirements. As long as that condition prevailed the price of eggs was so low that the special poultry farmer could not make a profit unless he was distinctly a genius at the business. But the time has come when the farm flock no longer meets market requirements. Consequently the price of poultry products has risen to a point that makes the special poultry farm possible, though the margin of profit is small, except for high-quality eggs at high prices. At the beginning of the World War, when the price of all kinds of feeding stuffs went up rapidly, many poultrymen in the Eastern States were driven out of business simply because the price of the products they had for sale did not increase as rapidly as their expenses. Between 1909 and 1919, the production of eggs in Rhode Island decreased 47 per cent, in Massachusetts 32 per cent, and in Connecticut 26 per cent. Practically all of this decrease occurred at the beginning of the war and is probably temporary.

The poultry farmer should understand that while the business when properly conducted is a good one, it is conducted on a small margin, and that a catastrophe like the European war, which sends the price of feed up more rapidly than it does the price of eggs, may put him out of business. Fortunately, such catastrophes are not of frequent occurrence.

## GROWING FEED GRAINS INSTEAD OF BUYING GRAIN.

In a general way, the producer's price for a product is the price at the market center less the cost of getting the product from the producer to the market center. The consumer's price is the price at the market center plus the cost of getting the commodity from the market center to the consumer.

A locality that grows a crop for sale gets producers' prices for it. One that uses more of a commodity than it produces pays consumers' prices for it.

Suppose, for instance, the average seaboard price of wheat for a period of years is 97 cents a bushel, and that the cost of getting Illinois wheat to the seaboard is 16 cents a bushel. Then an Illinois locality that grows wheat for export would get 97 minus 16, or 81 cents for its wheat. If it cost 7 cents to get a bushel of New York wheat from the farm to the seaboard, then a New York locality that grew wheat for export would get 97 minus 7 or 90 cents a bushel. In both cases the producer for export gets a producer's price.

Suppose it costs the same to get a bushel of corn to or from the seaboard as it does a bushel of wheat, and that the seaboard price of corn is 59 cents. Then an Illinois locality that grows corn for export would get 59 minus 16, or 43 cents a bushel for its corn. Under these conditions, what would a New York locality that imports corn from the West have to pay for it?

In the first place, freight rates to points near the seaboard from points far inland are usually based on the assumption that the commodity is sent to the seaboard and back to the neighboring locality. Thus, a farmer in eastern Washington who buys corn from Nebraska would pay freight on the corn from Nebraska to the Pacific coast and back to eastern Washington.

A New York farmer who buys corn from the West would thus have to pay the price at the seaboard plus the cost of getting the corn from the seaboard to him. If the seaboard price is 59 cents, and the cost of getting corn from the seaboard is 7 cents, the New York consumer would have to pay 66 cents. A New York farmer who grows corn for sale would also get 66 cents for it provided he did not grow enough to prevent import corn from determining the price.

On an average for the 10-year period 1900-1909 the average farm price of wheat in Illinois was 81 cents, and in New York 90 cents, producer's prices in both cases. The New York farmer got 9 cents more than his Illinois competitor because he was nearer seaboard.

During the same period the average farm price of corn in Illinois was 43 cents, while in New York it was 66 cents. The New Yorker who had corn for sale got 23 cents a bushel more for it than his Illinois competitor, because the Illinois price was a producer's price, while the New York price was a consumer's price.

Perhaps no New York wheat was actually exported during this 10-year period; but it is probable that the price New York growers got for wheat was based on export prices. The above suppositional cases are therefore probably very near the actual facts.

For the same period the average farm price of both corn and oats was just 50 cents per 100 pounds more in Massachusetts than in Illinois. This was because Massachusetts produced less corn and oats than it consumed. It paid consumers' prices for them. If it had

produced large quantities of these grains for shipment to distant markets it would have received producers' prices for them.

It was competition with the West that drove New England farmers out of the production of small grains. These crops have profited more by labor-saving machinery than any others. Western farmers, with their large fields and level lands, could take advantage of these means of cheapening production. The New England farmer, with his small fields, often hilly or rocky, or both, could not utilize them to such advantage. The western farmer could produce more cheaply; hence New England went in for types of farming that returned larger income per acre.

When this transition was taking place western farm lands were cheap, because there was yet much good land not occupied, and men would not pay high prices for land when by going a few hours' ride to the westward they could get similar land for almost nothing. But those days are past. Western farm lands have risen to the point where interest on the investment is often greater than the net revenue from the land after the farmer's living has been provided. When interest on this high valuation is added to other costs of production the actual difference in the cost of producing a bushel of oats or rye, East and West, is not so great as it once was.

Yet the advantage of cheap land might not be sufficient to enable the New England farmer to compete with the West in the production of small grains for sale. It would require considerable study of cost of production both East and West to determine this point. In the interest of farmers in both sections, such studies should be made. The types of farming to be recommended depend, in New England at least, on the results such studies would show. Does it cost 9 cents a bushel more to produce wheat in New England than in Illinois? If not, then New England could make more profit on wheat than Illinois.

At present, New England farm lands are largely devoted to hay, most of which is fed to cows. The concentrated feed which these cows use is mostly bought at consumers' prices. Even if it would not pay New England farmers to produce the small grains for shipment at producers' prices, is it not possible that it would pay them to produce enough of them to take the place of at least a large part of the concentrated feed they now buy? In that case they would save the difference between the cost of production and the consumers' price on their home-produced feed. It should not cost 16 cents more to produce a bushel of oats in New England than in Illinois, but New England dairymen pay at least that much more for the oats they buy from the West than the producer received.

It might be argued that the New Englander, even if he can produce concentrated feed cheaper than he can buy it, can grow other crops that make him more profit. If that is true then he ought to grow the other crops. But suppose that by proper use of manure and fertilizers he can greatly increase the yield of his hay land. That this is a possibility is hardly to be doubted. This would make it possible to produce the necessary hay for his cows on fewer acres at no greater cost per ton. In that case, would it not pay him to grow small grains to feed his cows and thus greatly reduce his feed bill? Cost of production studies would answer this question.

From the knowledge available it seems probable that it would pay New England farmers to produce at least as much oats, barley, rye, and peas as they can use for feed.

#### NEW YORK.

The hill lands of New York are similar in their adaptations to those of New England, and the chart shows the agriculture of the State to be similar to that of the New England States. At lower elevations considerable acreages of corn, wheat, oats, and beans are grown. Fruits and vegetables are also highly important in certain districts. The agriculture of New York is thus intermediate between that of New England and the States adjoining on the south, which are discussed later, in connection with the Corn Belt States.

#### THE COTTON BELT.

*Hay.*—The chart shows that the percentage of crop area devoted to hay is less in the Cotton Belt than elsewhere in the country. The amount of hay produced in this section is less than is needed for home use. Hay is imported into this region in large quantities, and many planters pay very high prices for it. Because of the large number of crops from which hay can be made, it is possible to grow some of them wherever farming is possible, but there is one highly important requirement which is not met in this region. To justify the farmer in relying on hay as a crop he must have dependable weather in which to cure it. This is not the case in the cotton States, except in the western portion, Texas, Arkansas, and Oklahoma, which have relatively larger acreages of hay than the other States of this group. Adding the kafir to the hay produced in Texas and Oklahoma, these two States produce about enough forage to meet their requirements. Oklahoma, in fact, produces some hay for shipment out of the State. In the States from North Carolina to Louisiana many farmers attempt to produce hay, but in all of them a large proportion of the hay is completely lost in the curing and much of the remainder is more or less damaged by untimely rains.

Even if the difficulty of curing hay did not exist in these States, they are so far from a possible market for any large quantity of the product that general reliance on hay as a cash crop would not be feasible here. Only individual farmers here and there over that part of the South having heavy rainfall, or at most an occasional restricted locality, can make hay a major source of income. In this region many ingenious devices for curing hay in bad weather are found.<sup>2</sup>

The high price at which hay sells in the South is due to the fact that much of the supply is brought from a distance. This is expensive in the case of a cheap, bulky product like hay. If methods can be devised that will enable southern farmers generally to cure hay satisfactorily it will then pay them to grow their own rather than to buy it at prevailing prices. But it should be remembered that hay

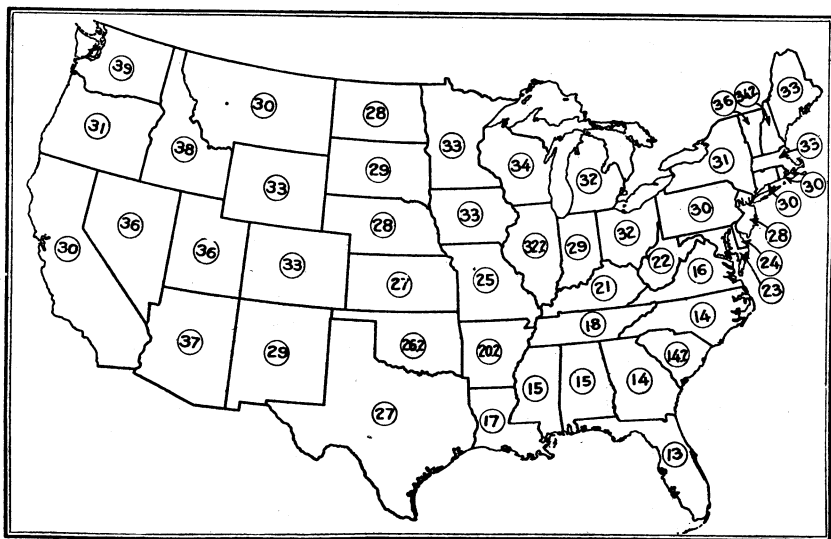
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<sup>2</sup> One of these devices is fully described in Farmers' Bulletin 956 of this department, *Curing Hay on Trucks*. Farmers' Bulletin 677, *Growing Hay in the South for Market*, and 977, *Hay Caps*, are also of interest.

as a cash crop, while profitable if only a few farmers grow it, would not be a possibility generally for farmers in this region.

*Wheat.*—The small acreage of wheat in these States is due to the fact that the climate is too warm for this crop. In dry countries wheat is often grown as far south as this, as in the Nile Valley, for instance. But it is not grown extensively in any part of the world where it is both so warm and so moist as in the Southeastern States.

*Oats.*—Most of the cotton States grow some oats, mainly as a winter crop, but for the last 50 years the average yield of oats in the more humid of these States has been from 13 to 17 bushels per acre (see Fig. 3). This is only about half the yield obtained in Wisconsin, Minnesota, Illinois, and Iowa, where the bulk of the commercial oat crop is grown. The small acreage of oats in this region is, therefore, easily understood. It is so far from a market





Should the South for any reason produce a material surplus of corn that would have to be sent to distant markets, the price would then become the price at the distant market minus the cost of marketing—a producer's price. This would mean much less than \$1 a bushel for corn in the Southern States.

It pays the southern farmer to grow corn for his own use, for in doing so he avoids paying \$1 a bushel for corn that he would otherwise have to buy. It would also pay him to produce corn for the local market, provided the quantity of corn grown locally was not sufficient to meet the entire local demand, as in that case he would get approximately \$1 a bushel for it. But it would not be possible under present conditions for southern farmers to make a living growing corn for shipment to distant markets. We may thus say that corn is not at present a general commercial possibility in the South. It is, however, the most important supply crop of the region, and the southern farmer is losing an important opportunity when he fails to produce the corn he needs on the farm. Possibly, with a highly efficient system of cooperative marketing, with material improvement in cultural methods, and with facilities for direct shipment from southern ports to Europe, the Southeastern States might grow corn for export. But at best the profit would be small. There are also difficulties to overcome in the way of insect pests and fungous diseases of the corn crop which are fostered by the warm climate of the region.

The development of cattle and hog raising would, of course, make a use for corn grown in this section; but because of the low yield of corn in the South and the resulting high cost of production, it would be necessary for southern stockmen to depend more on other forage crops than is the case in the Corn Belt.

*Fruits and vegetables.*—The sixth and seventh columns of the chart (fig. 1) show the percentage of crop area devoted to fruits and vegetables. Florida alone of the cotton group of States shows a considerable percentage acreage of these crops. According to the census of 1919, Florida had 8.3 per cent of her crop area in fruit and 6.6 per cent in vegetables. The present development of the trucking industry in Florida is about as extensive as market demand makes possible. There are important truck farming localities in several other of these States, but with very few exceptions these localities are producing all the vegetables that can be sold in normal years and more than can be marketed some years. These States produce winter and early spring vegetables for northern cities.

The market for such products will expand as the cities to be supplied increase in population, but it is evident that there is no possibility of expanding truck farming in the cotton States to take the place of cotton over any large area. Southern farmers could make no greater mistake than to extend suddenly the acreage of a crop like potatoes, watermelons, or sweet potatoes, of which the production is already so great as to be marketed only with difficulty. During the last census period there was a 25 per cent increase in sweet potato acreage. This was a very large increase, the utilization of which was made possible by better methods of keeping this perishable vegetable, making it available for a longer season. There might be a possibility of a further increase, with proper organization for extending the

market; but an increase of 50 per cent would mean less than half a million acres; there is thus no possibility of substituting this crop for cotton as a source of cash income generally over any considerable portion of the South. Unquestionably, however, the area of sweet potatoes should increase as markets for the product can be found.

*Cotton.*—Thus have been eliminated four of the five major crops, as well as fruits and vegetables, as general sources of cash income to southern farmers. This analysis renders clear why it is that in the past cotton has occupied so important a place in southern farming. Except in the limited number of localities producing rice, tobacco, fruits, and vegetables, and a few others in which live stock, especially hogs and cattle, are more or less prominent, cotton has been almost the only source of cash income. The possibility of other enterprises as a source of income in the South will be discussed later.

In the central and northern portions of the Cotton Belt the method of poisoning the boll weevil worked out recently by the Bureau of Entomology has proved effective, but in the drier regions of Texas and along the Gulf and the Atlantic coast, in fact, wherever, owing to existing factors of one kind or another, not more than half a bale to the acre may be expected, the process is not efficient, nor to be considered on account of cost. In case an economical means of fighting the boll weevil in this portion of the Cotton Belt is not found, it would seem that cotton culture must here play a less important part than it has in the past. Already a marked decrease in acreage of cotton has occurred in the southern portion of the Cotton Belt. In 1909, 20 per cent of the crop area of Florida was in cotton; in 1919, only 6 per cent. The cotton area has been similarly reduced in many other localities adjacent to the Gulf and ocean. In south central Alabama, where the soil favors grass growing, and hence live-stock farming, there was a marked reduction of cotton acreage during the last census period, amounting in Montgomery County to 68 per cent, Coosa and Pike Counties 62, Lowndes County 59, Bullock County 56, Wilcox County 51, and Marengo and Greene Counties 50.

As the second column of the chart shows, corn is already an important crop in this region, occupying more acreage than cotton in several of the important cotton-growing States. Several important grasses grow readily here, such as Johnson grass, Bermuda grass, Dallis grass, orchard grass, Vasey grass, carpet grass, and Sudan grass. In addition to peanuts and velvet beans, several other legumes are already grown more or less. These are cowpeas, soy beans, lespedeza, bur clover, and in some localities hairy vetch. The mungo bean also is adapted to this region. Sorghum and sugar cane are at home here and produce large quantities of excellent forage. So far as the production of feed is concerned, an excellent basis is provided for live-stock farming, making dairying and the raising of beef cattle and hogs feasible industries. In those sections where cotton acreage has already been materially reduced, farmers are turning to cattle and hogs. A creamery established only last year in southern Georgia is now making about 2,000 pounds of butter a day, and has a ready sale for it.

Problems relating to live-stock management have thus risen to the status of major problems in this region. Some of the leading

problems of this class relate to feeding and management, to the care of milk and its products, improving the native stock by the selection of better breeding animals, and the warding off of internal parasites which the mild winters permit to live over from year to year.

Live stock is already important in the agriculture of this region; that is, of the southern portion of the Cotton Belt, including a strip of country extending up the Atlantic coast to North Carolina. In number of beef cattle in proportion to crop area, Florida leads every other State east of the Rocky Mountains. Texas, West Virginia, Iowa, Louisiana, Missouri, and Mississippi follow next in order. In number of hogs as compared with crop area, Florida leads every State in the Union, Iowa being a close second, each of these two States having nearly twice as many hogs per 1,000 acres as Louisiana, which comes next, with Indiana a close fourth.

It is true that much of the live stock in this coast country, especially the cattle, are not very closely associated with the farming. In Florida they are range animals, and get their feed in the open the year round. To some extent the same thing is true of the hogs, but the very fact that these two classes of animals have long been prominent in this region points the way to the development of a stable agriculture in which cotton may play a very minor part. Live-stock farming in the future appears to be the only generally applicable alternative to cotton growing in this region. This gives rise to a new set of problems which must be solved if live-stock farming is to be successful. Some of them have already been mentioned. Perhaps the most important not mentioned above is that of pastures. The production and utilization of silage is another.

The difficulty of curing hay in this region and the importance of satisfactory methods have been mentioned. In most of the region, live stock can be kept on pastures nearly the year round, so that the use of hay is less important than farther north where the winters are more severe. Even in sections where it is not practicable to cure hay at all, the use of silage and of special winter pastures, such as barley, Italian rye grass, rye, hairy vetch, bur clover, and perhaps several other grasses and legumes, including velvet beans, will make the wintering of stock entirely practicable. Types of farming based on live stock thus appear to be worthy of encouragement in this region, and the problems connected with live-stock farming here should receive the most serious attention of those charged with their study.

*Alternatives.*—The crops shown in the last column of the chart are of interest as possible alternatives for cotton growing in the strip of land near the water in which it appears that cotton growing must be reduced. First, we have tobacco in North Carolina. There is considerable acreage of this crop in several other of these States. But the acreage of tobacco in this country is already as large as market possibilities permit. Not only that, but every soil type produces a tobacco peculiar to itself; a new brand of tobacco, unless it is of very superior quality, which is not often the case, is not easy to introduce on the market. Tobacco is not generally available as a substitute for cotton as a source of cash income.

Next we have velvet beans in Georgia and Florida. A considerable acreage of this crop is also grown in other cotton States and it grows readily as far north as the lower portion of South Carolina.

If some method could be devised for harvesting the seed of this crop there would be a possibility of developing its culture as a source of stock feed which should find ready sale in the live stock region of the North. At present the seed is mostly picked by hand, a process too expensive for general use. This crop is used widely for soil improvement, for which it has great value; but this does not bring directly a cash income. Velvet beans are a splendid winter pasture for cattle and the development of live-stock farming in this region would furnish a means of utilizing the crop in such manner as to add materially to the income of the farm.

Florida shows a large acreage of crops "hogged off" (the lined portion of the bar in the chart). These are mainly peanuts, corn, and velvet beans. The bar labeled P. & B., shown for Alabama, consists mainly of peanuts. This entire region is well adapted to the production of peanuts, particularly of the Spanish variety, and the crop is already an important one in this region.

It is utilized in two ways, in addition to the sale of as much of it as possible for human consumption. Perhaps the largest proportion of the crop is used as hog feed, the hogs harvesting the crop. The hams from peanut-fed hogs have at times in the past enjoyed an enviable reputation for their fine flavor. The bacon is also good, although some people object to its oily nature. Peanut hay with the nuts on is an excellent nitrogenous feed for cattle, and it is also very fattening because of the oil in the seeds. The peanut crop might thus be made a partial basis for an important live-stock industry in this region.

Very large quantities of coconut oil, soy-bean oil, peanut oil, and other vegetable oils are imported into this country, the largest import being of coconut oil. Peanut oil can be substituted for coconut oil in all of its uses and is fully equal to it for any purpose. In 1919 we produced about 80,000,000 pounds of peanut oil and imported about 80,000,000 pounds from China. Imported soy-bean oil comes mainly from Manchuria and coconut oil from the Tropics. We could easily produce enough peanut oil to replace all of these imports, but this would have to be done in competition with oriental and tropical labor.

Rice, which appears in Louisiana, and also in smaller percentage areas in Texas, Arkansas, and to some extent in others of these States, is confined to restricted areas where the land is sufficiently level to permit flooding, and where water is at hand for this purpose. It is not available as a substitute for cotton over the South generally. Besides, we are already producing more rice than we use, and are exporting it in considerable quantities in competition with the countries of southeastern Asia.

This crop was formerly much grown on the lowlands along the Atlantic coast above salt water. The lands here are very soft, and the labor available not easily trained in new methods. The work was mostly done with one-horse implements, or by hand. When rice growing developed on the prairies of Louisiana, Texas, and Arkansas, where the land is firmer, and where large labor-saving implements could easily be used, rice growers along the Atlantic coast were largely driven out of business like the New England growers of such crops as oats and barley, when these crops began to be produced on a large scale in the Middle West.

The soy bean thrives throughout this region. It yields well, and the seed contains about 18 per cent of oil of high value. The entire plant makes good forage. With the development of cattle and hog farming, this crop might have an important place here. Should the oil mills be able to pay enough for the seed to make soy beans a profitable crop the acreage of the crop might be expanded greatly.

#### MOUNTAIN AND PACIFIC COAST STATES.

*Cotton.*—In the Mountain and Pacific Coast States, cotton is eliminated by climate except in parts of New Mexico, Arizona, and California. Relatively little land in New Mexico is at sufficiently low elevation for this crop, but there is considerable good cotton land in Arizona and a large amount of it in California. The industry has already developed to important proportions in Arizona and is rapidly developing in southern California. Up to the present time these States are free from the boll weevil and it is to be hoped they will remain so, for the world will soon need the cotton they could grow.

*Corn.*—A little corn is grown for local use in nearly all of the Mountain and Pacific Coast States, but it is only in parts of Colorado, New Mexico, Arizona, and California that climatic conditions are sufficiently favorable to enable farmers to rely upon it as a crop. The reason why corn occupies so small a place in the agriculture of Arizona and California is that in this region it must compete with alfalfa as a supply crop. Alfalfa is strictly at home here and produces more forage to the acre than corn. It therefore occupies the major portion of the area which might otherwise be devoted to corn.

*Oats.*—The position of the oat crop in this group of States is of special interest. The yield of oats per acre in Washington, Idaho, Utah, and Arizona is higher than it is in any other State in the Union (see fig. 3).

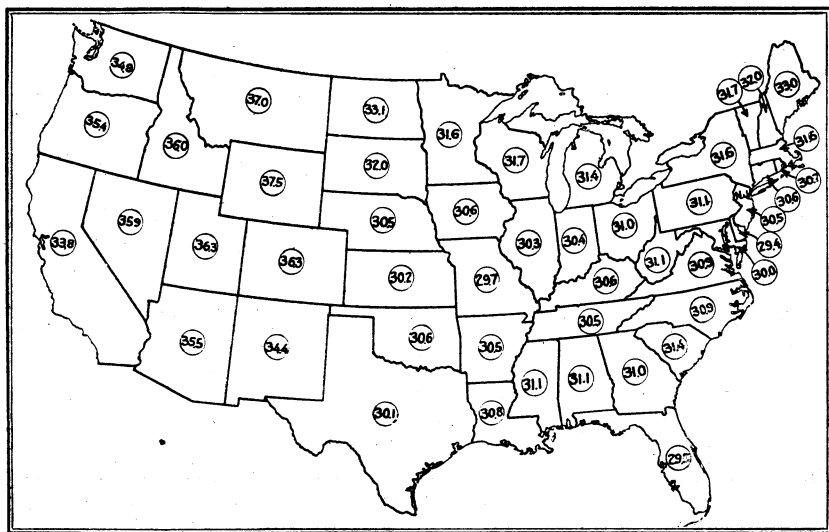
The lowest average yield in any one of the Mountain States is 29 bushels, the same as for Indiana. In the matter of weight per bushel, every State in this group exceeds any State to the east of it (see fig. 4). In general, oats yield more to the acre and are of better quality in this group of States than anywhere else in the United States. Yet, outside of the Willamette Valley of Oregon, near the large city of Portland, and a few localities in other States near large cities, oats are for the most part grown only as a supply crop in all these States. In much of this area oats are confined to irrigated land, and this accounts in part for their relatively small acreage. They are also so low in price as to limit greatly the possibility of shipment to distant markets.

*Fruits and vegetables.*—Aside from fruits in California, crops of this class occupy a less important position in all these States than they do in the States of the Atlantic seaboard from Virginia northward. California, mainly because of climatic advantages, has a larger percentage acreage of fruit than any other State in the Union; that is, 14.8 per cent of the total crop area. Washington, Oregon, and Idaho also have topography and climate suitable to fruits, and these States have considerable acreage of this class of crops. But

even in California the major portion of the land is occupied by other crops. With suitable markets, there is a possibility of large increases in fruit acreage in this group of States, particularly in California, Washington, Oregon, and Idaho.

*Wheat and hay.*—As cotton and corn are eliminated from most of this region mainly by climatic conditions, and the production of oats, fruits, and vegetables is reduced to small proportions by economic considerations, the major portion of the land is occupied by wheat and hay. Nearly all these States have a considerable area of wheat land. The crop is sufficiently high priced to permit shipment to distant markets. It therefore occupies most of the land not taken up by the hay crop.

The position of the hay crop here is of special interest. Throughout this region alfalfa thrives abundantly and the yield of alfalfa hay per acre is about twice that of the more common hay crops of



California is one of the leading bean-growing States, though the acreage is too small to show on the chart. The smaller acreage of this crop in New Mexico (lined portion of the bar in the chart) is relatively much more important in the agriculture of that State. We already grow all the beans for which a market can be found; there is, therefore, no opportunity for important extension of bean acreage.

Kafir and barley are important crops in the southern States of this group. In parts of California, where good markets are near, barley appears to be a more profitable crop than wheat and is largely grown.

*Animal enterprises.*—Cattle and sheep ranching are important in all these States because of the vast areas of land for which irrigation water is not available and on which the rainfall is not sufficient to make crop farming possible. On the farms, dairying is highly important, and the output of dairy products, particularly in the Pacific States, is increasing rapidly. Poultry farming is important locally, particularly in parts of California, where highly intensive methods and excellent cooperative marketing organizations have put the industry on a firm basis.

The problems of this region are those relating to the larger enterprises mentioned. They are not nearly so urgent as those to which the advent of the boll weevil in the Cotton Belt has given rise. The alfalfa weevil is perhaps the most serious pest.

#### PLAINS STATES.

The group of States from Kansas to North Dakota has, in the main, a well-balanced agriculture except in the case of North Dakota. In Nebraska and South Dakota, but more particularly in Nebraska, the agriculture is perhaps as well-balanced as it is in any State in the Union.

*Corn and wheat.*—The area of corn in North Dakota is very small, because the seasons are so short that it is not safe for farmers to depend on corn for grain to any large extent, even as a supply crop. In eastern South Dakota conditions are better adapted to corn, and this crop occupies 20 per cent of the acreage. In eastern Nebraska the conditions are well-nigh ideal for corn, which occupies a larger percentage area in that State than any other crop. The percentage area of corn in Kansas is much reduced as compared with Nebraska. There are two reasons for this.

In the first place, in the year 1919 to which the chart relates, Kansas responded well to the urgent request of the Government for increased wheat production, an unusually large acreage being sown in the fall of 1918, before the armistice. That year it had about 30 per cent above its normal wheat acreage. A very large part of this extra wheat area was taken from the corn crop. In 1918 Kansas had slightly more than 6,000,000 acres of corn, approximately a normal acreage, while in 1919 it had only a little more than 4,000,000 acres. Corn is thus more important in Kansas and wheat less important than the chart indicates.

In the second place, farming in Kansas extends throughout the State, while in Nebraska it is confined largely to the eastern portion. Eastern Kansas is as well adapted to corn as it is to wheat.

Western Kansas is somewhat dry for corn, the kafirs replacing corn in that part of the State to a considerable extent, but is better adapted to wheat.

The preponderance of wheat acreage in Kansas, as shown in the chart, is thus due to greatly increased acreage for that year and to the greater area of real wheat country in the State than in adjacent States.

*Oats.*—In this group of States, and in Oklahoma and Texas just to the south, oats occupy a relatively large acreage. This is partly due to the smaller acreage of corn in this region, a fact which makes the oats desirable as a supply crop, and partly to the fact that the climate in this group of States is better adapted to oats than it is in the more humid districts in the same latitude to the eastward. Oats extend farther south in regions of moderate rainfall than in more humid regions.

*Hay.*—In Kansas and North Dakota, hay occupies about the same percentage of the crop area as it does in the central Corn Belt. It is here mainly a supply crop, but more or less limited markets give an outlet for a portion of the crop. In Nebraska and South Dakota, the western half of each State is largely given over to the range industry. The large number of range animals makes a considerable market for hay, so that hay in these two States occupies relatively a larger acreage than in the other two States of this group.

*Barley and rye.*—In the Dakotas, where the corn acreage is relatively small, and particularly in North Dakota, where it is almost negligible, barley and rye rise to importance. These two crops, as well as oats, would probably become more important in the agriculture of the Middle West should it for any reason become advisable to reduce the corn acreage. One reason why rye is prominent in North Dakota is that it is the only available crop for fall sowing, thus giving a better seasonal distribution of labor.

*Live stock.*—Cattle and hogs are of great importance in the agriculture of Nebraska and South Dakota, giving a splendidly balanced agriculture in these two States. Live stock is of less importance in Kansas, particularly in the western two-thirds of the State, mainly because of the predominance of wheat. In the eastern part, where much corn is grown, live stock occupies an important place and the agriculture is excellently balanced.

The farming of North Dakota is too closely confined to one class of crops, the spring grain crops, to be well balanced. The work on these crops is largely concentrated at certain periods, leaving other periods idle. Crops are needed that will give better seasonal distribution of labor. Another weakness is the lack of live stock. The absence of corn in this State makes it hardly advisable to attempt to develop beef farming and hog raising to the extent these industries are developed farther south, but the dairy industry might well be enlarged in those sections of the State in which good pasture in summer and succulent feed for winter can be relied upon. The climate is well suited to the handling of milk. Barley, rye, oats, sweet clover, and alfalfa, together with brome grass and sweet clover pastures, seem to offer a foundation for the production of feed for dairy cows in the more humid sections of the State. Furthermore, butter and cheese are sufficiently high-priced to permit their shipment to any market. There are times when dry weather would



make short pastures. The absence of corn for silage would constitute a handicap, but this difficulty may possibly be overcome by the breeding of varieties better adapted to local conditions, also by the use of sunflowers for silage.

#### THE CORN BELT.

To bring out clearly the relations existing between the real Corn Belt States and the States immediately to the north and south of them, they are here discussed together.

The central Corn Belt consists of the States of Ohio, Indiana, Missouri, Illinois, and Iowa. So far as the prevailing types of farming are concerned, Nebraska, eastern Kansas, and the southeastern portion of South Dakota belong with this group, but have already been discussed in another group because of the more or less intermediate character of their agriculture between that of the Central and the Mountain States.

#### THE NORTHERN DAIRY BELT.

Immediately to the north and east of the central Corn Belt is a group consisting of three North Central and three Eastern States in which the agriculture is intermediate between that of the Corn Belt and that of New York and New England. The three North Central States of this group are Michigan, Wisconsin, and Minnesota. The Eastern States belonging in this belt are Pennsylvania, West Virginia, and New Jersey. On the whole, the agriculture of the three North Central States shows slightly more influence of the northern climate than the corresponding Eastern States. The acreage of corn in Michigan, Wisconsin, and Minnesota varies from 16.2 per cent of the whole crop area in Wisconsin to 17.5 per cent in Minnesota. In the three corresponding States to the eastward corn occupies a more prominent place, the percentage acreage in Pennsylvania being 22.8, in New Jersey 26.8, and West Virginia 32.8. West Virginia is the most southern of these States and lies in a climatic belt more favorable to corn.

In this entire belt, from Minnesota to New Jersey, dairying is highly developed, while in the central Corn Belt its place is largely taken by the production of beef and pork. Presumably it is the smaller percentage acreage of corn in the northern dairy belt as compared with the central Corn Belt that largely determines this difference.

Correlated with this small proportion of corn acreage in the dairy belt is the large proportionate acreage of hay, made practicable by the large number of dairy cows, and in the eastern portion of the belt by the many large cities not far away that offer a market for hay. Wisconsin has about twice as many dairy cows in proportion to its crop acreage as either Michigan or Minnesota, a fact which appears to account satisfactorily for the larger percentage of hay in that State. Michigan has in the past exported considerable hay, but the excess of hay in Minnesota over that of most of the Corn Belt States is mainly due to the large number of dairy cows.

It is an interesting fact that in the three North Central dairy States, where the acreage of corn is considerably less proportionately than in the three Eastern States, the acreage of barley and rye is

considerable. To a certain extent these grains take the place of corn in the feeding system. If for any reason it should become advisable to reduce the acreage of corn in the Corn Belt, barley and rye might presumably be used to occupy a large part of the acreage thus made available.

Wisconsin lies on the line between winter and spring wheat, but is not well adapted to either. Much wheat was grown in this State in early days, but it readily gave way when the dairy industry became important. Michigan is better suited to winter wheat and has a larger acreage than Wisconsin. Minnesota lies well within the spring wheat territory and has a relatively large acreage of this crop. But much of the soil of southern Minnesota contains rather too much clay for wheat. This characteristic is favorable to oats, and a large development of the oat crop is found in that State.

Wheat is rather prominent in Pennsylvania, especially in those sections where good silt or silt loam soils are found. It is less prominent in West Virginia, mostly because of the relatively small proportion of good wheat land, and still less so in New Jersey, partly because of the lack of good wheat soils and partly because of the excellent markets near by for more intensive crops.

In percentage acreage of oats, Wisconsin and Minnesota lead all other States except Iowa and about equal Illinois (see fig. 1). In fact, oats are prominent in this entire belt of States, both east and west, as they are also in New York and all of the central Corn Belt States. The only other part of the country of which this is true is the group of States occupying the eastern edge of the Plains region, and Oregon. The presence of a relatively large acreage of oats in these Western Plains States has already been explained.

The difference between the North Central and the Eastern States of the dairy belt in percentage of oat acreage is caused partly by difference in yield. The average yield of oats in West Virginia for 50 years is 22 bushels, in New Jersey 28, and in Pennsylvania 30, while in Michigan, Wisconsin, and Minnesota the average yields are, respectively, 32, 34, and 33 bushels. In weight per bushel of oats the three North Central dairy States exceed the three Eastern in this belt. Oats, therefore, are somewhat better adapted to the climatic conditions of the three North Central dairy States, and the acreage is accordingly larger. It is to be observed also that Wisconsin, Minnesota, Illinois, and Iowa, which exceed all other States in relative oat acreage, are immediately adjacent to the great grain markets of Chicago and Minneapolis. Oats are so cheap a commodity that they will not bear high transportation costs. The commercial oat crop is therefore grown in the immediate vicinity of the best markets for it.

The chart (fig. 1) shows that New Jersey leads all other States in the relative acreage of vegetables, having 17.3 per cent of its crop land devoted to crops of this class. This is due to two causes, one being proximity to two of the largest cities in America, which furnish a market for an enormous quantity of vegetables. New Jersey is more favorably situated in this respect than any other State. The other cause is the large proportion of sandy soil in this State, which enables truck growers to supply the market with their products in advance of other States having similar climatic conditions. Pennsylvania and West Virginia also have a large population to supply

with vegetables, and the acreage of these crops is larger than it is on the average for the country.

Michigan and Wisconsin, and to a less extent Minnesota, also have large city populations near by, and an abundance of sandy soil, of which the vegetable growers of these States take advantage to the full extent of the market demand. In the production of fruits, the eastern States of this belt far exceed the western, although Michigan produces a relatively large quantity of fruit, especially along the eastern shore of Lake Michigan, where climatic conditions are advantageous to fruit culture.

#### SOUTH CENTRAL CORN BELT STATES.

To the south and east of the central Corn Belt is a group of five States—Maryland, Virginia, and Delaware in the east and Kentucky and Tennessee in the west—which have many points in common in their farming and which differ in a similar manner from the Corn Belt States. The most striking difference between this group and the central Corn Belt is in the relative oat acreage. The reason for this is mainly climatic. The average yield of oats for 50 years in Maryland, Virginia, Delaware, Kentucky, and Tennessee is, respectively, 23, 16, 24, 21, and 18 bushels, while in Ohio, Indiana, Missouri, Illinois, and Iowa it is 32, 29, 25, 32.2, and 33. In weights of oats per bushel there is not much difference between these two groups of States. The difference in yield, and the greater distance from the best markets for oats, appear to be responsible for the difference in relative acreage. In all five of these States on the southern edge of the Corn Belt the acreage of hay is limited to some extent by the difficulty of curing hay in the moist climate. Kentucky and Tennessee are somewhat far south for timothy and clover and the relatively large acreage of hay in Tennessee is made up partly of millet. If these States were better adapted to the production of hay they are near enough to the southern hay markets to justify a relatively larger acreage of this crop.

In Maryland, Virginia, and Delaware wheat is prominent, particularly in Maryland, mainly because of the presence of large areas of soil excellently adapted to this crop. Kentucky and Tennessee are slightly too far south for wheat, and in those States the crop is rather strictly confined to the best wheat soils.

Four States in this group surpass all others in the Union in percentage of corn acreage. Kentucky has a larger percentage of its crop area in corn than any other State. Tennessee is second, Delaware third, and Virginia fourth, while Florida is fifth and Iowa sixth. This statement includes in the corn acreage, corn cut for forage, which is included under hay and forage in the census figures. The total crop area on which percentage acreages are based includes estimates of the acreage of fruits and nuts.

The relatively large acreage of corn in Kentucky and Tennessee is not caused by the fact that corn is better adapted to climatic conditions here than elsewhere. It is due rather to lack of adaptation to other crops. Kentucky and most of Tennessee are too far north for cotton. They are somewhat too far south for wheat, considerably too far south for oats, and the relatively heavy rainfall, together with the poor adaptability to timothy and clover, renders it

impracticable for farmers generally in these two States to depend upon market hay as a major source of income. Corn, which does well here, is thus left to occupy the major portion of the crop area.

On maps showing distribution and density of the corn crop Kentucky does not appear to be an important corn-producing region. This is because so much land in that State is occupied by blue-grass pasture. Florida also is not an important corn-producing State, in spite of the great relative importance of corn in the local agriculture; only a small proportion of the State is cultivated, corn occupying a larger percentage of this area than any other crop.

Both Kentucky and Tennessee produce considerable quantities of fruits and vegetables, and the three Eastern States in this same belt produce large quantities of these crops. The predominance of fruits and vegetables in Maryland, Virginia, and Delaware is due in part to soil and climatic conditions and in part to the neighboring presence of a very large consuming population.

In the miscellaneous column of the chart (Fig. 1) the only crop that appears in any of these five States is tobacco in Kentucky. Virginia, Maryland, and Tennessee have smaller acreages of this crop.

#### THE CENTRAL CORN BELT STATES.

We come now to the great corn, beef cattle, and hog producing States of Ohio, Indiana, Illinois, Iowa, and Missouri. It has already been stated that eastern Nebraska might properly be included in this group, also eastern Kansas and a portion of South Dakota. What is said here applies to these latter States or portions of States as well as to the five Central Corn Belt States.

The agriculture of this section and that of the dairy belt to the north and the corn States just to the south is the best balanced in the country. Corn, wheat, oats, and hay are prominent in all of them, except in the five States constituting the southern margin of the Corn Belt, where oats are relatively unimportant.

The small acreage of wheat in Iowa is explained by the fact that while this State lies in the winter wheat region, the soil generally contains so much clay that winter wheat often freezes out. This is true of the northern portion of Illinois and of adjacent portions of other States. But this peculiarity of the soil is favorable to oats. This fact and the presence near by of the best markets in the country for oats account for the predominant position of the oat crop in Iowa and Illinois.

In this group of the five Central Corn Belt States, Ohio alone has a relatively large acreage of hay. This is due partly to the presence, especially in the northeastern portion of the State, of a large number of dairy cows, and partly to the fact that Ohio, like Michigan, is near enough to eastern hay markets to permit the shipment of considerable quantities of hay in that direction. In the past both of these States have also shipped material quantities of hay to the South. In fact, the agriculture of the northeastern half of Ohio is more similar to that of Michigan and Wisconsin than to the rest of the Corn Belt.

Three States in this group have approximately 40 per cent of their acreage in corn; Ohio a little less, Iowa a little more. If Iowa could

grow winter wheat to better advantage it is probable that her acreage of wheat would be larger and of oats somewhat smaller.

Both climate and cropping systems in this group of States adapt the region eminently to the production of meat. Corn is the cheapest of the fattening feeds. It is the possibility of converting enormous quantities of corn into meat, together with the suitability of soil and climate, that accounts for the very large acreage of corn in this region. Corn is so cheap a commodity that it can not stand high transportation costs. It is therefore utilized mainly on the farm where grown or on neighboring farms as feed for live stock.

Students of the agriculture of this region have raised the question whether farmers here have made a mistake in putting so much of their land in corn. In connection with this question, attention is called to Figure 5, which shows the acreage, yield per acre, production, and the December 1 farm price of corn from 1866 to 1921 for the United States.

Following 1866 there was a fairly regular and rapid increase in corn acreage. This was a period of rapid settlement in the western corn-producing States. But it was also a period of falling prices. As shown in the second section of the table, yields were exceptionally low in 1874, 1881, 1887, 1890, 1894, and 1901. In each of these years there was abnormally low rainfall in July in the Corn Belt. In no year since 1901 has the yield per acre fallen so far below the average.

In these years of low yield, the price curve shows a decided upward bend. Aside from these years of high prices due to low yield, the trend of prices was downward from the beginning of the period to 1896. About 1886 the price had reached so low a level that farmers in the eastern portion of the Corn Belt began to substitute other crops for corn, although in the western portion, where settlement was in rapid progress, corn acreage increased largely, because farmers in that region had no alternative except wheat, and the price of that was too low to be attractive. The very low level to which corn prices had fallen prevented the corn acreage of the country as a whole from expanding for about a decade. There was a large increase in acreage in 1895, in the midst of the great panic of that period. The price of everything had fallen, and because no advantage was to be gained by substituting other crops for corn, farmers returned to a normal acreage of this crop. From that time onward to 1912 there was a gradual, and in the main constant, increase in acreage. At the same time there was a rather rapid increase in the price of corn, the average for the entire country rising from 22 cents in 1896 to 59 cents in 1915. The European war brought very high prices which, however, had little or no effect on the acreage of corn. In fact, the purchasing power of corn did not increase materially. The very large corn crop of 1917 was due to the fact that in that year 31 per cent of the total winter wheat acreage of the country was abandoned because of winter injury. A considerable proportion of this wheat land was devoted to corn. But the next year, with the price, but not the purchasing power, still at unprecedented heights, the corn acreage came back to its previous normal, where it has since remained. The fact that there has been no increase of corn acreage since 1912 (indeed, there has been a slight decrease except for the year 1917), is attributed to the fact that by that time practically the entire region adapted to the production of corn had been fully settled.

Because of the enormous acreage of this crop, any considerable percentage increase in it would materially affect the acreage of

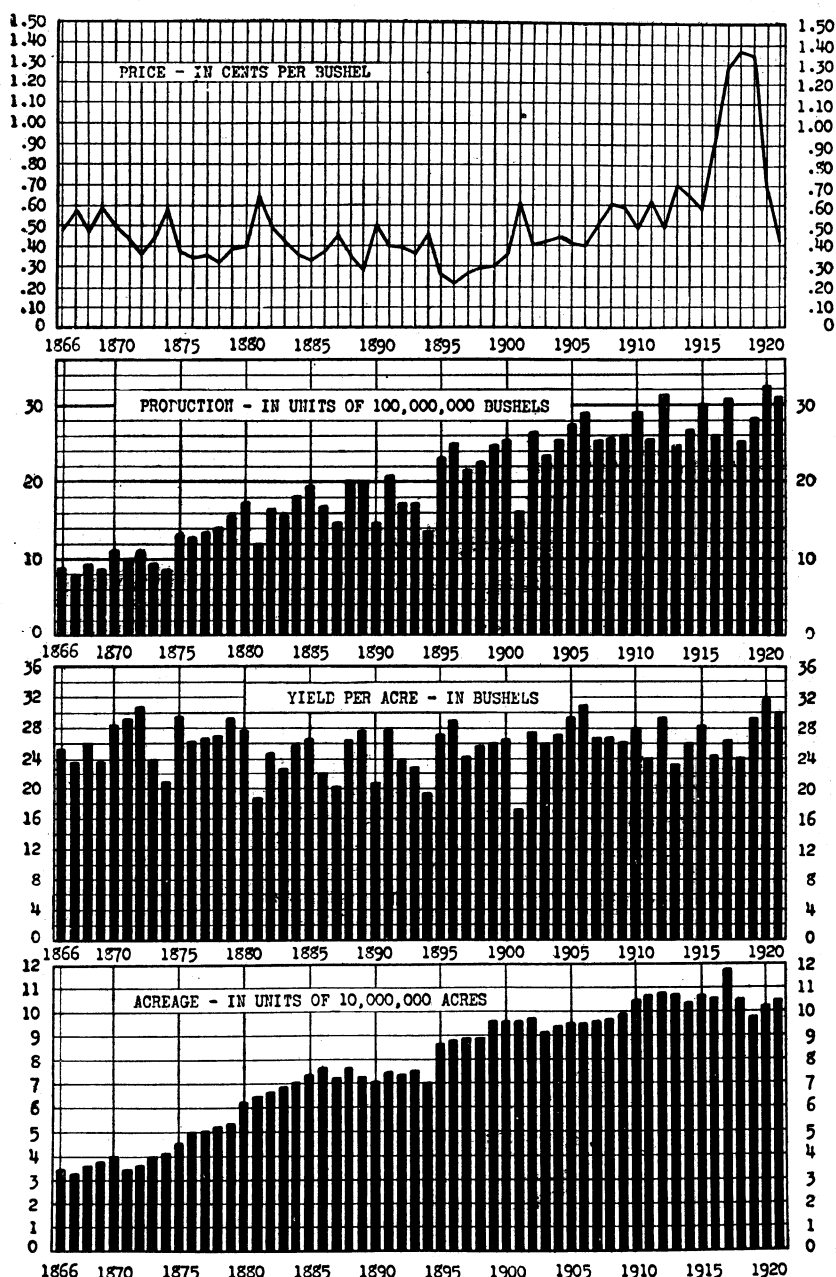


FIG. 5.—Acreage, yield, production, and price of corn yearly from 1866 to 1921, inclusive.

other crops or of pasture, either of which would seriously disturb the balance of farming in the regions affected.

The demand for corn and for the animal products produced by the feeding of corn will undoubtedly increase as population increases.

The price of corn, and of all other products for that matter, may fall below cost of production during short periods of financial depression; but aside from such general financial depression, and in the absence of disturbing factors to change the normal course of events, it would seem that corn is hereafter to be a more profitable crop in those regions best adapted to its culture than in the past.

Under these conditions it would hardly be rational to expect Corn Belt farmers to make any material reduction in their acreage of corn except as a means of meeting a temporary depression in price.

*Possible disturbing factors.*—There are a few possible developments which may affect the status of corn in the Corn Belt. One of them is the advent of the European corn borer. It is now reasonably certain that this insect will invade the entire Corn Belt. It is well established along the entire shore of Lake Erie in Ohio and Michigan. Its annual rate of natural spread, by flight, according to the entomologists, is about 6 miles a year. Quarantines have been established with a view to preventing its artificial spread at a greater rate. If these quarantines are successful it will thus be many years before it covers the entire corn country. Should this insect greatly reduce the yield of corn per acre, it is probable that there will and should be a corresponding decrease in acreage of this crop. Fortunately, in the opinion of the entomologists, the injury from the corn borer, if proper methods are used by farmers in combating it, will probably not be severe. The main difficulty will be in disposing of the corn stalks left standing in the field, for the insect winters over in these stalks. This can be done by breaking off the stalks when the ground is frozen, and then burning them, as that would destroy most of the insects.

Another possible disturbing element is the development of cattle and hog farming that is going on along the southern edge of the Cotton Belt, where efforts at fighting the boll weevil have not been as successful as they have farther north. The South has always been an important market for pork products. If that section should ultimately produce enough pork and beef to supply the needs of the southern people, there must be either a material increase in the export of meat to Europe from the Corn Belt States, or a material reduction in the quantity produced unless the increase in population in the North and West is sufficient to consume the surplus.

There is, however, a possibility of considerable increase in the consumption of meat in this country. The retail price of meat in our larger cities is high. If a better system of distribution of meat and meat products could be devised, thus lowering retail prices, there is reason to believe that the consumption of them would increase. If such increase in consumption could be brought about by reduction in the cost of distribution, then the development of cattle and hog raising along the Gulf and the South Atlantic coast should not seriously interfere with the present meat industry of the Corn Belt States.

*Possible new crops for the Corn Belt.*—In a region in which the principal income of farmers is from live stock and their products,

it is possible to bring about important changes in the crops grown without materially affecting the types of farming prevailing. Corn Belt farming is two-story farming. The lower story consists of crops, the upper of live stock and their products. The lower story might be reorganized without materially affecting the upper story. The problem of reorganizing Corn Belt farming is thus quite different from that of reorganizing the farming of a region which obtains its principal revenue directly from crop products.

Attention has already been called to the extensive development of barley and rye as grain crops in the group of States to the north of the Corn Belt, and to the possibility that these two crops might replace corn to a certain extent in the Corn Belt States should such replacement become necessary. While they would not furnish as much feed per acre as corn does, they could be used as a substitute for corn to a considerable extent in the fattening of beef cattle and hogs.

The soy bean crop is already coming into Corn Belt agriculture at a rapid rate. Students of farming in this region foresaw this result many years ago. In the southern half of the Corn Belt farmers have long felt the need of some spring crop to sow between corn and wheat. It is not satisfactory to sow wheat after corn unless the corn is cut and shocked, and it is not practicable to utilize the corn fodder from so large an acreage as is grown here. Oats have hitherto been much used for this place in the rotation. But in this section oats are an uncertain crop, and the yield averages low. Soy beans appear to be the ideal crop to substitute for oats to follow corn and precede wheat. They leave the land in excellent condition for wheat without plowing unless it is very weedy, and even this difficulty can be overcome by planting the beans in rows and cultivating them a few times. It is well to remember, however, that the necessity of cultivating the soy beans would reduce the acreage of corn a given working force could manage. The crop is a legume, and leaves considerable nitrogen in the soil for the wheat crop that follows. Soy beans after corn and preceding wheat also assist in controlling scab, which is due to a fungus affecting both corn and wheat.

Farther north, where oats are a logical crop, soy beans are being sown very generally in corn; in fact, they are often planted with the corn. When this is done, rape may be sown between the rows at the last cultivation of the corn and beans. This practice is particularly advantageous on farms where corn is hogged off. In fact, soy beans may be planted with corn throughout the Corn Belt to excellent advantage. The crop thus has two important places which it may occupy in Corn Belt rotations. It makes good hay, and is a splendid substitute for alfalfa or clover in the winter feeding of brood sows and other hogs. Not only that, but the seed contains about 18 per cent of an oil which is intermediate in character between the semi-drying and the drying oils. A considerable proportion of soy-bean oil can be substituted for linseed oil in the manufacture of paints, varnishes, linoleum, etc.

Enormous quantities of soy-bean oil are imported every year, mainly from Manchuria. Factories are now being built in the Corn Belt for handling soy beans as a source of oil. If it should turn out that



these factories can pay farmers a sufficient price for soy beans to make the crop profitable, there is every reason to expect soy beans to rise to the proportions of a major crop in this section.

Sweet clover is another crop that in recent years has made much headway in this region. It is excellent as a soil renovator, makes good pasture and good hay. The fact that it is a biennial, and thus matures seed the second year, after which the entire plant dies, makes it fit better into Corn Belt rotations than does alfalfa. If it becomes necessary to reduce corn acreage, the area devoted to sweet clover might well increase materially.

Alfalfa can be grown practically throughout the Corn Belt, though it is not so well adapted to the more or less acid soils of this region as it is to the alkaline soils of the West. The principal difficulty in growing alfalfa in the Corn Belt is the fact that the first cutting of alfalfa must be made just at the time of the first cultivation of the corn crop. This makes a very serious labor conflict. The second cutting comes just at the time of wheat and oat harvest. However, the conflict between alfalfa and the small grains is not so important as that between alfalfa and corn, partly because the small grains are less important as crops in the region, and partly because of the shortness of the harvest season. Then, too, the cutting of the alfalfa may be delayed the few days necessary to get the grain crops out of the way. The third cutting of alfalfa comes at a season of the year when Corn Belt labor is not fully occupied, and thus introduces no conflict.

These labor conflicts constitute the principal reason why alfalfa has not made more headway in the Corn Belt. If it should become necessary to reduce the corn acreage, the conflict with this crop would become less important. This would permit the acreage of alfalfa to expand, for with a smaller acreage of corn to tend a larger acreage of alfalfa hay could be harvested.

Finally, should the ravages of the European corn borer prove to be much more severe than is anticipated, and should it become necessary to make a very material reduction in corn acreage because of this pest, or for any other reason, it would appear to be advisable to give some attention to the sunflower crop in this region. Sunflowers grow readily all over this country. They are already grown for silage in considerable acreage, especially in regions where the acreage of corn is small. A vegetable oil is manufactured from sunflower seed in large quantities in Russia and some other countries of southeastern Europe. This oil, when properly refined, can be substituted for cottonseed oil and coconut oil in practically all their uses. It is a semi-drying oil and can be substituted for a part of the linseed oil in paints and varnishes.

The culture of sunflowers is more like that of corn than any other crop adapted to the Corn Belt. In fact, it is identical with that of corn except for the harvesting, for which methods would have to be worked out. Still it is not advisable to grow this crop on any large scale as a source of sunflower-seed oil unless the necessity for so doing arises. It would, however, appear to be the part of wisdom to have abundant knowledge of the crop so that if the necessity for cultivating it should arise there would be a body of knowledge that would insure success in its culture and utilization.